Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Unlicensed Use of the 6 GHz Band	)	ET Docket No. 18-295
	)	
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz	)	GN Docket No. 17-183
	)	

REPLY COMMENTS OF SOUTHERN COMPANY SERVICES, INC.

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March 18, 2019

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EXECUTIVE SUMMARY

Southern Company Services, Inc. is a wholly-owned subsidiary service company of The Southern Company, a holding company which operates electric and gas distribution utilities, and power generation and transmission facilities. As further explained in Southern's Comments in this proceeding, Southern relies on fixed microwave to backhaul data from applications that are critical to utility operations.

In these Reply Comments Southern responds to several arguments raised in the comments of entities advocating for access to the 6 GHz microwave bands for unlicensed devices. Although there is widespread agreement that unlicensed sharing of the 6 GHz spectrum might be viable if there is a carefully structured Automated Frequency Control system ("AFC"), the proponents of unlicensed use have requested significant concessions that would effectively negate the ability of an AFC to prevent interference from all unlicensed devices. For example, proponents of unlicensed operations advocate for uncontrolled operation of "Low Power" and "Very Low Power" devices, and for the coordination protections of the AFC to be built on assumptions, averages, commercially-untested technologies, and theoretical statistical probabilities. The fixed microwave systems licensed on a primary basis in the 6 GHz band are used to support public safety and the delivery of essential public services such as electricity, transportation and communications. As such, the AFC should be required to use conservative and time-tested engineering principles to ensure there will be no harmful interference to these critical communications systems. Interference protection for systems that support public safety, health and welfare should not be left to chance.

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Southern Company Services, Inc., on behalf of itself and its operating affiliates (collectively "Southern"), hereby submits its reply to certain of the comments filed in response to the *Notice of Proposed Rulemaking,* FCC 18-147 ("*NPRM*"), in the above-captioned matter.[1] As explained below, the FCC should evaluate all of the proposals in this docket against a very simple benchmark of whether the recommendation is based on conservative engineering principles or whether it relies on assumptions, averages, and statistical probabilities that could leave the nation's critical infrastructure exposed to disruption.

The proponents of unlicensed radio local access networks ("RLANs") view the 5.925-6.425 GHz and 6.425-7.125 GHz bands (together the "6 GHz" band) as a potential home for new consumer technologies. However, interference protection for licensed communications systems cannot be based on the mere hope that hundreds of millions of randomly deployed devices will strictly conform with the proponents' assumptions, averages, commercially-untested

[1] The *NPRM* was published at 83 Fed. Reg. 64506 (Dec. 17, 2018), setting a reply comment deadline of March 18, 2019.

technologies, and theoretical statistical probabilities. Southern submits that only through the use of conservative and time-tested engineering principles can the FCC allow RLANs to share the 6 GHz band while adhering to its mandate to manage radio spectrum "for the purpose of promoting safety of life and property."[2]

In particular, the FCC should not allow uncontrolled and uncontrollable devices to operate in the band absent solid engineering that demonstrates that transmissions from such a device, alone or in the aggregate with other unlicensed devices, could not possibly cause harmful interference to a 6 GHz fixed microwave system. This standard is very reasonable because it is the same standard followed by all applicants and licensees at 6 GHz through the Part 101 frequency coordination process. If anything, the technical standards for unlicensed devices should be more stringent because the users of such devices will not, for all practical purposes, be subject to the same level of accountability and enforcement as are licensed users.

If the FCC decides to allow deployment of unlicensed devices in the 6 GHz band, it will have one chance - and only one chance - to get it right. There will be no practical opportunity to remove these devices from the band or adjust their operating parameters to prevent interference. Technical and operational controls must be incorporated into all unlicensed devices from the beginning.

I. The FCC Should Not Permit the Uncontrolled and Uncontrollable Deployment of So-Called "Low Power Indoor" Devices

RLAN proponents claim that until an Automated Frequency Coordination ("AFC") system can be deployed, equipment manufacturers should be allowed to sell "Low Power Indoor" devices ("LPIs") that would operate autonomously in the U-NII-5 and U-NII-7 segments

[2] 47 U.S.C. §151.

of the 6 GHz band. They suggest that the following factors should make the likelihood of interference from LPIs sufficiently low for most microwave systems:

- the relatively low power of the devices,[3]
- the use of labels that will identify the devices as indoor-use only,[4]
- the assumption that consumers will follow instructions,[5]
- the assumed average building losses,[6]
- the assumed location of most access points in homes and offices,[7]
- the assumption that there could be polarization mismatch or antenna pattern mismatch,[8]
- the assumption that transmissions from an LPI will probably overlap a microwave signal only partially,[9]

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[3] *See, e.g.*, Comments of Microsoft Corporation on the *NPRM* (filed Feb. 15, 2019) at 5-11; Comments of NETGEAR, Inc. on the *NPRM* (filed Feb. 13, 2019) at 2; Comments of the Public Interest Organizations on the *NPRM* (filed Feb. 13, 2019) ("PIO Comments") at 17-20; Comments of Apple Inc., Broadcom Inc., Cisco Systems, Inc., Facebook, Inc., Google LLC, Hewlett Packard Enterprise, Intel Corporation, Marvell Semiconductor, Inc., Microsoft Corporation, Qualcomm Incorporated, and Ruckus Networks, an ARRIS Company on the *NPRM* (filed Feb. 15, 2019) ("Apple *et al*. Comments") at 17-39; Comments of Qualcomm Incorporated on the *NPRM* (filed Feb. 15, 2019) ("Qualcomm Comments") at 9-11; and Comments of Wi-Fi Alliance on the *NPRM* (filed Feb. 15, 2019) ("Wi-Fi Alliance Comments") at 10-19.

[4] *See, e.g.*, Apple *et al*. Comments at 32, Qualcomm Comments at 10, Wi-Fi Alliance Comments at 19.

[5] Apple *et al*. Comments at 32.

[6] *See, e.g.*, Apple *et al*. Comments at 23-24; Qualcomm Comments at 9, 17; Wi-Fi Alliance Comments at 12-13.

[7] *See, e.g.*, Apple *et al*. Comments at 23, 25; Wi-Fi Alliance Comments at 12.

[8] *See, e.g.*, Apple *et al*. Comments at 25, Wi-Fi Alliance Comments at 13-14.

[9] Apple *et al*. Comments at 26.

- the assumption that microwave paths are typically engineered to stay clear of high-rise buildings,[10]
- the assumption that fade margins engineered into microwave systems can accommodate additional noise,[11]
- the assumption that LPIs will probably be used at times when microwave systems will not be in fading conditions,[12] and
- the assumption that actual interference will typically be undetectable by microwave licensees.[13]

Proponents also predict there will be such strong consumer demand for these uncontrolled, less expensive, and easier-to-deploy devices that there will be less demand for higher-power devices that would be controlled by an AFC.[14] In an odd twist of logic, they are suggesting that by allowing the deployment of millions of these uncontrolled and uncontrollable consumer devices the interference potential to microwave systems might be reduced because there will be less market demand for higher-power and more expensive devices controlled by an AFC. In this one argument alone, the RLAN proponents concede that there will be a significant interference potential even for devices controlled by an AFC, but that this interference potential could be reduced if consumers instead elect to operate low power devices indoors, on any channel, at any time, at any geographic location, and without microwave licensees having a

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[10] *Id*. at 22.

[11] *Id.* at 45.

[12] Wi-Fi Alliance Comments at 14.

[13] Apple *et al*. Comments at 45.

[14] PIO Comments at 20.

practical ability to identify the source of the interference or to require the device to be deactivated. In other words, they concede that there could be less potential to detect and remedy interference in the band because there will be no practical way to identify and account for this noise as "interference" as there would be with an AFC system.

RLAN proponents would like to sell and deploy devices without having to pro-actively ensure that the devices, as deployed, will not interfere with fixed microwave systems. However, public safety agencies, electric utilities, railroads, commercial communications providers, and other entities responsible for maintaining the nation's critical infrastructure should not be compelled to take it on faith that interference to their critical communications systems will be "unlikely" based on a series of assumptions, averages, and statistical probabilities, with absolutely no mechanism to withdraw or adjust these devices if the assumptions do not conform with reality.[15] Allowing LPIs or other uncontrolled devices in the 6 GHz band could create a classic "tragedy of the commons" situation, but the tragedy would impact public safety and the delivery of essential public services, such as electricity, transportation and communications.[16] Southern therefore strongly opposes the introduction of "Low Power Indoor" devices that are not controlled by an appropriately configured AFC.

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[15] Comments of AT&T Services, Inc. on the *NPRM* (filed Feb. 15, 2019) ("AT&T Comments") at 14, 16 (protection for fixed microwave must be near flawless because otherwise statistical performance of the system will degrade and will slowly die "death by a thousand paper cuts"); Comments of Comsearch on the *NPRM* (filed Feb. 15, 2019) ("Comsearch Comments") at 8 (rules governing unlicensed devices cannot leave interference protection to chance).

[16] Comments of Motorola Solutions, Inc. on the *NPRM* (filed Feb. 15, 2019) ("Motorola Comments") at 6 (If LPIs are fielded without an AFC there will be no way to control them or restrict their locations.).

II. The FCC Should Not Allow the Indoor and Outdoor Use of Uncontrolled "Very Low Power Devices" in the 6 GHz Band

RLAN proponents have also recommended the authorization of very low power devices, operating at a maximum 14 dBm EIRP, that could be used indoors or outdoors without restriction. Proponents claim these devices are unlikely to interfere with fixed microwave systems, based on similar assumptions and statistical probabilities as for LPIs, but with lower maximum EIRP and without losses attributable to building attenuation to for outdoor use.

For all of the reasons cited above with respect to LPIs, Southern urges extreme caution in considering whether to allow such uncontrolled operations in the 6 GHz band. Technical studies submitted in this docket indicate that devices operating at or slightly above 14 dBm could interfere with fixed microwave systems within certain distances.[17] It cannot be emphasized enough that the 6 GHz band is used on a primary, licensed basis for critical communications and is not at all comparable to other bands, like the 2.4 GHz band where very low power Part 15 devices have been authorized to co-exist with other Part 15 devices and Part 18 Industrial Scientific and Medical (ISM) devices. Southern has concerns that flooding the environment with very low power devices could raise the noise floor at 6 GHz and/or create interference situations that will not be susceptible to correction. Southern looks forward to reviewing further technical analyses regarding the risks to fixed microwave systems if the FCC permits the uncontrolled deployment of very low power Part 15 devices in the 6 GHz band that could be used indoors or outdoors.

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[17] Kizer, George, *Determining the Impact of Non-Coordinated Indoor 6 GHz RLAN Interference on Fixed Service Receivers*, Attachment A to Comments of the Fixed Wireless Communications Coalition on the *NPRM* (filed Feb. 15, 2019) ("FWCC Comments"); *Sharing in the 6 GHz Band by Unlicensed Low-power Indoor Devices*, Appendix A to Comsearch Comments.

III. To Prevent Disruption to the Nation's Critical Infrastructure, Automated Frequency Coordination Must Be Based on Conservative Engineering Principles, Not Assumptions, Averages, or Statistical Probabilities

There is general consensus in the record that an AFC system with sufficiently stringent technical parameters might allow operation of unlicensed access points in the 6 GHz band without interference to fixed microwave systems. However, the "devil is in the details," and the technical requirements for the AFC and the unlicensed devices must be based on conservative engineering principles that will absolutely prevent interference to fixed microwave. RLAN proponents agree that an AFC should be required, but also recommend operating conditions for the AFC that would negate the ability of the AFC to actually prevent interference.

Representatives of fixed microwave users provided significant information in the record about the critical uses to which this spectrum is placed, and why the interference criteria and coordination processes are so stringent.[18] However, instead of building on decades of industry experience in standard-setting and frequency coordination, RLAN proponents essentially advocate that unlicensed devices should be coordinated with less stringent criteria to minimize the cost of unlicensed equipment.[19] Their arguments frame the cost-benefit analysis as favoring reduced cost of unlicensed equipment to stimulate consumer demand and to increase revenue to equipment suppliers at the cost of reducing the reliability of vital communications systems that support public safety and the delivery of essential public services.

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[18] *See, e.g.*, Comments of APCO International on the *NPRM* (filed Feb. 15, 2019) at 4-5; Comments of the Association of American Railroads on the *NPRM* (filed Feb. 15, 2019) ("AAR Comments") at 3-5; AT&T Comments at 6-9; FWCC Comments at 6-9; Comments of Idaho Power Company on the *NPRM* (filed Feb. 15, 2019) ("Idaho Power Comments") at 2-6; Comments of Tucson Electric Power Company and UNS Electric, Inc. on the *NPRM* (filed Feb. 15, 2019) at 6-8; and Comments of the Utilities Technology Council, the Edison Electric Institute, *et al.*, on the *NPRM* (filed Feb. 15, 2019) at 3-7.

[19] PIO Comments at 18.

RLAN proponents argue that the operating requirements for the AFC should be based on averages, assumptions, and statistical probabilities that they claim should be adequate to protect most fixed microwave systems from interference, that will allow use of less expensive end-user devices, and that will allow these devices to make more intensive use of the band. By arguing that relaxed technical standards will lead to more intensive use of the band by unlicensed devices, RLAN proponents gloss over the fact there will be a greater absolute number of interference cases if statistical modeling is used.

Every fixed microwave system was coordinated, licensed and constructed to meet the licensee's requisite level of protection using time-tested engineering criteria. The coordination and licensing process ensures that every fixed microwave system will maintain that level of reliability even when other paths are coordinated into the band. These systems were not licensed with the expectation that availability could be reduced from time-to-time by random actions of third-party spectrum users. Although propagation models might be useful when estimating mobile system coverage, actual interference is very different, very real and very debilitating to critical microwave communications systems.[20]

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[20] Comments of the National Spectrum Management Association on the *NPRM* (filed Feb. 15, 2019) at 25-31 (citing to a 2003 NTIA report showing how the standard deviation of the estimation error from two propagation models evaluated against 41,000 field measurements varied from 9.2 dB to 25.7 dB and an average deviation of 14.0 dB for one model, and between 6.0 dB and 20.8 dB and an average of 12.8 dB for the other model. Differences in estimation between the two models was as high as 20 dB in some cases. Propagation modeling is not an exact science and the deviation between losses estimated by a model and actual measurements could allow significant interfering signal levels into fixed microwave receivers if the AFC defines exclusion zones through propagation modeling.)

Southern disagrees with many of the arguments raised by RLAN proponents in their effort to water-down the effectiveness of the AFC in preventing actual interference (as opposed to statistically possible interference):

- **The AFC and the RLAN it controls should be updated more frequently than once every thirty (30) days as advocated by RLAN proponents**.[21] Licensing records supplied to the AFC and the RLANs should be updated daily to account for fixed microwave systems that will commence operation under conditional authority or special temporary authority. Updating the AFC and devices only once every 30 days would allow an unlicensed device to interfere with critical communications facilities for up to 30 days.[22]
- **RLANs should be required to transmit identifying information and actual operating information back to the AFC**. Southern disagrees with RLAN proponents who argue that collection of this information would jeopardize consumer privacy. [23] Neither the identifying information for a device nor the channels on which it operates involves information in which anyone could claim an expectation of privacy. Moreover, the AFC would be unable to selectively de-authorize one or more

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[21] Apple *et al.* Comments at 42 (arguing, without evidence, that there is only a small chance that an RLAN could be operating on a channel that will be used by a microwave link that is activated less than 30 days from the initial application); Wi-Fi Alliance Comments at 23.

[22] AT&T Comments at 19; Comsearch Comments at 17; Idaho Power Comments at 7; Motorola Comments at 2-3.

[23] Apple *et al.* Comments at 64-65.

devices believed to be causing interference if it does not have information about the device(s) in question.[24]

- **RLANs should be capable of ordering a device to change frequencies or cease operation**. Southern disagrees that merely updating a device's channel list will be sufficient. The AFC must be capable of ordering a device to adjust operations to aid in mitigating interference from a device or class of devices that are suspected of causing interference.[25]
- **Algorithms used to define RLAN exclusion zones should be premised on free-space loss, and not on propagation models that are based on assumptions or statistical probabilities**. Unless it can be shown that the AFC will calculate path losses based on actual environmental data the AFC should be required to use conservative values, even if that would tend to overprotect some percentage of microwave systems.[26] An AFC operator that incorporates actual environmental data to calculate exclusion zones would have an advantage in the marketplace because it could protect smaller exclusion zones and correspondingly greater operating areas for the access points it controls. Use of propagation models that are based on statistical

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[24] Motorola Comments at 3; Comsearch Comments at 23 (AFC operator should have kill switch authority); Comments of Federated Wireless, Inc. on the *NPRM* (filed Feb. 15, 2019) at 7 (without knowledge of a device's location and operational parameters the AFC system operator cannot demonstrate that it is effectively enforcing protections or implementing modifications to its calculations in the event of interference); Comments of Verizon on the *NPRM* (filed Feb. 15, 2019) at 4 (the AFC should be a close-loop control system).

[25] Motorola Comments at 3.

[26] FWCC Comments at 25; AT&T Comments at 4-5 (proponents of unlicensed use should have the burden of demonstrating by clear and convincing evidence that the proposed uses will cause no harmful interference).

probabilities will guarantee that many microwave paths - which are licensed on a primary basis and used to support public safety agencies and Critical Infrastructure Industries - will be underprotected from unlicensed devices operating on a strictly secondary, non-interference basis.

- **The AFC should incorporate techniques to prevent aggregate interference from RLAN devices unless the AFC operator can demonstrate that aggregate interference is impossible from the devices it controls**. With the many millions of devices that RLAN proponents estimate will be deployed, it is hard to believe that interference from multiple devices could never impact any of the thousands of microwave paths currently licensed in the 6 GHz band or that continue to be added to the band.[27]

IV. Conclusion

There is too much at risk to public safety, health and welfare to allow uncontrolled and uncontrollable unlicensed devices to be deployed in the 6 GHz band. Although an AFC might help prevent interference between unlicensed devices and primary licensed fixed microwave systems, the rules would have to mandate use of the AFC for all unlicensed devices and the operating parameters must be based on extremely conservative engineering principles to ensure there is zero potential for interference into fixed microwave systems.

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[27] Motorola Comments at 3; Comsearch Comments at 19, 22; Comments of Ericsson on the *NPRM* (filed Feb. 15, 2019) at 21-22; AAR Comments at 13; AT&T Comments at 16.

WHEREFORE, THE PREMISES CONSIDERED, Southern Company Services, Inc. respectfully requests that the Commission take action in this docket consistent with the views expressed herein.

Respectfully submitted,

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